SKYWARNEWS

National Weather Service State College, PA - Spring 2003

"Working Together To Save Lives"

Pennsylvania winter of 2002-03 in review

by John La Corte, Senior Forecaster

The sun has moved back to our side of the Equator and it appears that the back of winter has finally been broken. After five of the last six winters registered warmer than normal temperatures, this year brought the region back to reality coming in around 2 to 4 degrees below normal.

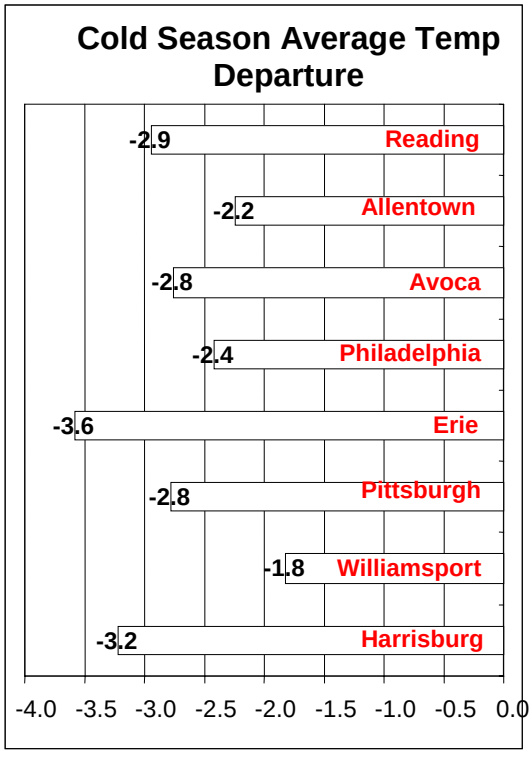

Figure 1. Summary of Cold Season Average Temperatures around Pennsylvania

Figure 1 shows a summary of the departure from normal temperatures for the period November 2002 through March 2003 from reporting sites in Pennsylvania. The "traditional" winter runs from December through February, and the temperatures during that time were actually a degree or so colder on average than the 5 month period depicted in figure1.

Snowfall for nearly the entire past decade has been rather anemic here in central Pennsylvania. All but three years saw snowfall well below normal (Fig. 2). The only exceptions were the winters of 1993, 1994 and 1996. This year brought a return to the storminess of yesteryear and the first winter of above average snow since the mid 1990's.

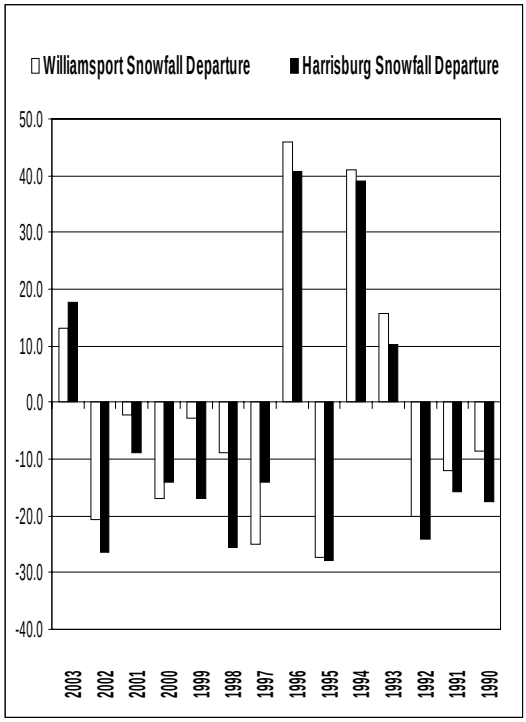

Figure 2. Snowfall departures for Harrisburg and Williamsport since 1990

The severity of the winter may be more perception than reality for most people. As a season for the record books, this will be recorded

as rather uneventful. For the three month period of December through February, neither Harrisburg nor Williamsport managed to crack even the top 10 coldest winters on record. Harrisburg averaged 27.8 degrees in that time which placed it as just the 12th coldest winter since records began back in 1888. Williamsport's winter average temperature was 25.5 which was just 18th on the list of coldest winters. Records in Williamsport have been gathered since 1895.

The perception that the winter has been an especially long and cold one could have something to do with the relatively mild winters we have had recently, or it could be that this season the cold and snow seemed to set in very early in the fall. Several inches of heavy wet snow fell in many locations back on the 29th and 30th of October. Williamsport measured 1.7 inches of snow from that storm. It was pointed out in our Winter edition of the SkyWarnews that when measurable snow occurs in October, the following winter is statistically very likely to be snowier than normal. After totaling up the snow for this season, it appears that statistic panned out nicely this year!

Also of significance was the number of "major" snowfalls that occurred. In a normal winter, we can usually expect snow storms producing 4 to 6 inches or more of snow to occur about 2 times. This past winter saw several storms of significance which began back in early December when on the 5th, Harrisburg measured nearly 7 inches of snow and Williamsport had 8 inches. There was also the record setting Christmas day snow storm that dropped 8 inches of snow in Harrisburg and 7 inches in Williamsport. It all culminated in the storm of February 16-17 that dropped more than a foot of snow over a wide area all the way from southern Pennsylvania up through New England.

Summer Outlook

To continue the admittedly newfound tradition of the newsletter attempting to predict the upcoming season, we once again take a look at some statistics to hopefully gain insight into what the upcoming summer season will hold in store for us?

The seasonal outlook from the National Weather Service's Climate Prediction Center calls for a warmer than normal summer here in the northeast, while we are expected to see about normal precipitation.

Our own numbers show that in Harrisburg, after a winter that is snowier than normal, there is a 76% likelihood that the following summer will be colder than normal. No need for sunscreen right? Looking at similar data for Williamsport yields a very different correlation. After a snowy winter, the following summer is colder than normal just 39% of the time.

Since that was not very revealing, we dug a little deeper. Climatology shows that when we have a colder than normal winter, Williamsport has a cold summer just 33% of the time. Harrisburg has a slightly higher correlation, seeing a colder than normal summer 58% of the time after a cold winter.

What will the summer be like? We choose to refer back to another bold statement from our previous newsletter, "…So we are left to wait and see, which is also known as "job security" for the weather forecasters of the world."

The Big One: It can happen Again!

by Kevin Lipton, General Forecaster

Late in the afternoon on Friday, May 31 1985, a huge tornado outbreak sliced across Ohio and Pennsylvania. More than 40 tornadoes raked Pennsylvania that day, with nearly 30 exhibiting intensities of F3 or higher, based on the Fujita Scale of Tornado Intensity. One tornado in Mercer County of western Pennsylvania actually reached the F5 level of this scale, which produced "incredible" damage. This tornado was the only F5 tornado ever recorded in Pennsylvania. This tornado developed in eastern Ohio, then traversed western Pennsylvania, sweeping right through the town of Wheatland. This tornado caused 7 deaths in Wheatland, along with 32 injuries. Many businesses were damaged, and at least 50 homes were destroyed.

Many other intense tornadoes affected central Pennsylvania that day. One tornado of F4 intensity developed just west of Pennfield in Clearfield County. This tornado traveled 69 miles to the east, crossing portions of Cameron, northern Centre, and Clinton Counties. Fortunately, the bulk of damage afflicted by this tornado was on trees, as it crossed the Moshannon State Forest. An estimated 88,000 trees were uprooted, and the width of this tornado grew at one point up to 2 miles wide. A total of 13 homes were destroyed when the tornado developed just west of Pennsfield.

Another tornado of F4 intensity developed over southeast Warren County, and tracked toward the east southeast across McKean and Elk Counties. The most severe damage was near Kane, where the schools incurred nearly $3,000,000 damage, and at least 3 businesses and 99 homes were destroyed.

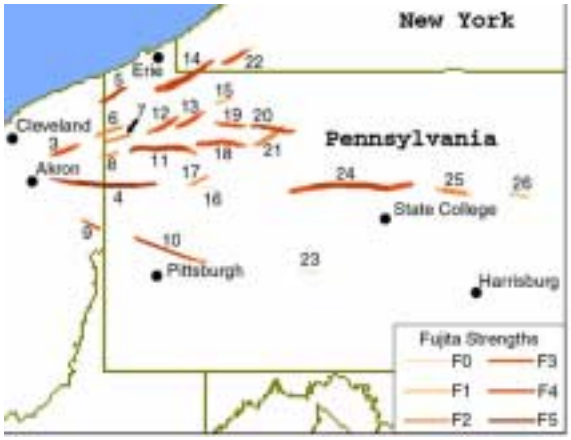

Figure 3. Map showing tornado tracks from the 31 May 10985 outbreak. The number corresponds to the count of tornadoes that day, taken from a larger map.

Yet another F4 tornado sliced across portions of Lycoming, Union and Northumberland Counties. The tornado swept across North White Deer Ridge, and continued to just northeast of Watsontown in Northumberland County. The tornado briefly lifted as it crossed the ridge, but then redeveloped and grew in size to 1.5 miles wide as it crossed the Susquehanna River. In Union County, a total of 48 campers, 8 homes, 3 mobile homes, and 18 vehicles were destroyed. In Northumberland County, 30 mobile homes were destroyed near Dewart, along with 77 homes and 140 mobile homes. This tornado killed 6 people, 3 of which were in mobile homes, 2 in houses and one in a camper. Damage estimate for the 3 counties was 16 million dollars.

As can be seen, strong tornadoes can and do occur in central Pennsylvania. This outbreak not only proved this, but also dispelled the myth that tornadoes do not occur near mountainous terrain. In fact, several of the tornadoes that occurred crossed areas that were between 2000 and 3000 feet in elevation (above mean sea level).

Can such an outbreak occur again? Well, merely 13 years later, two significant tornado outbreaks occurred within just a few days across central Pennsylvania. On May 31 1998, 10 tornadoes touched down in central Pennsylvania. Then just 2 days later on June 2nd , another 8 tornadoes developed. In fact, Somerset County was raked by two separate F3 tornadoes, one on the 31st, then another on the 2nd. As hot, humid air masses collide with incoming cool, dry air from the west and north, it's only a matter of time before another large outbreak of strong tornadoes affects central Pennsylvania.

Severe Weather…What can we Expect?

by John La Corte, Senior Forecaster

After the recent "severe" winter, most people will be glad to see a return of warm weather, skies filled with lazy cumulus clouds and maybe even a little humidity. However, the return of warm weather also inevitably brings a return of thunderstorms and severe weather.

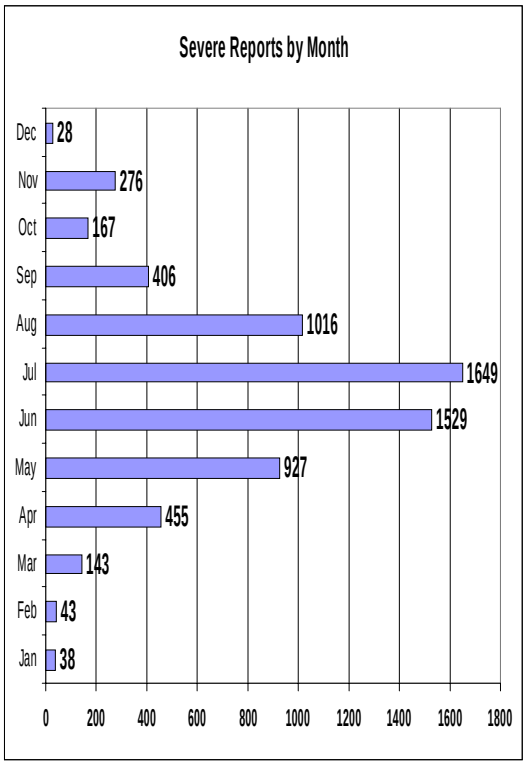

Figure 4. Severe weather report summary for Pennsylvania.

Figure 4 shows how fast we spin up in the spring with regard to the number of severe weather reports. In March the number of severe events experienced stands at a little fewer than 150. By May the number increases more than 6-fold with more than 900 severe reports having been

recorded in that month. By the peak of our severe weather season in July, nearly 1700 separate reports of severe weather have been recorded. So it should be apparent that the severe storm season follows the warmth across the region, with the peak of severe weather coinciding with the climatologically warmest month.

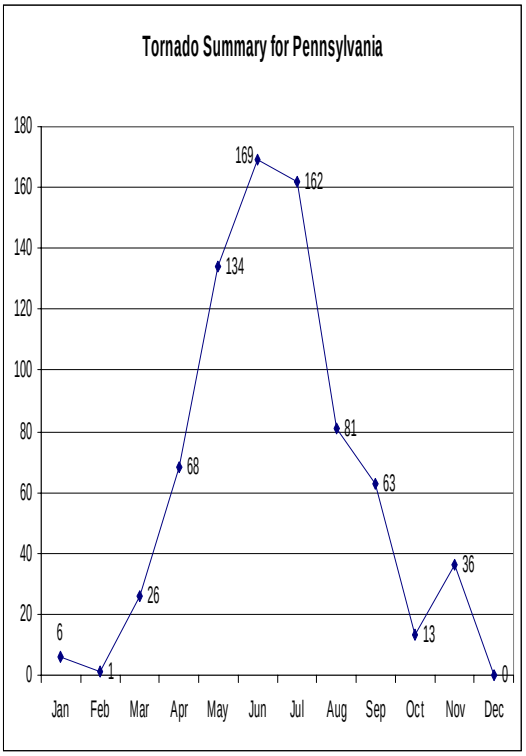

Figure 5. Tornadoes by Month for Pennsylvania

When it comes to tornadoes, the state is definitely not immune (See the previous article). While there have been almost 800 tornadoes observed in Pennsylvania since records began back around 1950, the majority of them (58%) are of the weak to moderate variety, F0 or F1 (See an explanation of the F scale at the end of this article). The real "monster" tornadoes, F4's and F5's are very rare in Pennsylvania. Just 31 of these have been observed, with a staggering 21 of those being observed during the super outbreak of May 31, 1985 detailed in the previous article.

While they are very rare, F4's and F5's are the region's, as well the nation's premier killer when it comes to tornadoes. Here in Pennsylvania, there have been 303 known deaths directly caused by tornadoes. Of those, just 2% (5 deaths) were attributed to F0/F1 tornadoes. The rarest tornadoes, the F4/F5 variety are responsible for 64% (194 deaths) of the known fatalities. So as you can see, these storms have a well earned reputation as killers.

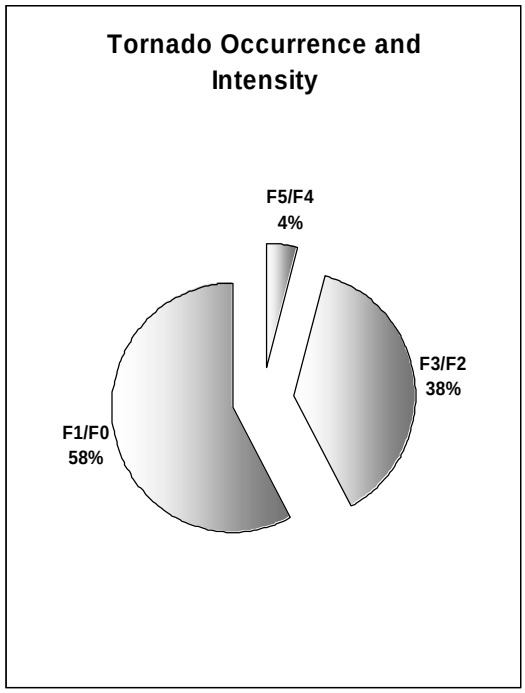

Figure 6. Tornado Occurence and Intensity

What's this "F" stuff referred to when talking about tornado intensity? It was invented by Dr. Theodore Fujita back in the 1970's when he did pioneering research on tornado intensity and destructiveness. He assigned intensities to tornadoes judging their wind speeds by the kind of damage observed. This scale may see some revision in coming years, but it has been a standard in the severe weather community for about 30 years now. The scale is as follows:

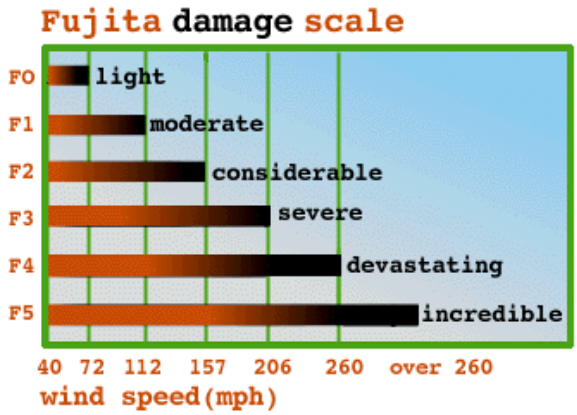

Figure 7. Fujita Tornado Scale

So enjoy those lazy hazy days that are just ahead, but keep a wary eye to the sky when you see those cumulus boiling under the hot sunshine.

Recent Additions and Enhancements to our Website

by Michael Dangelo, Senior Forecaster and Webmaster

Thanks to hard work by our Information Technology Officer, Ron Holmes, and Senior Forecaster, John LaCorte, as well as others across the NWS, there have been some exciting additions to our webpage recently.

One of the most exciting additions debuted during the late autumn and winter: On-Line Severe Weather Reporting. Yes, you can send your severe weather reports directly to our office. The information you submit will help us to better define areas of concern for severe weather watches, warnings and advisories. Check out the Spotter Reporting Page, and submit your reports at:

http://www.erh.noaa.gov/er/ctp/report.shtml

Another enhancement that was added recently was a searchable database of the record highs, lows and normal conditions at Harrisburg and Williamsport (the two first order climatological stations in Central Pennsylvania). You can access this database from our Climatology (Past Weather) Page:

http://www.erh.noaa.gov/er/ctp/climo.shtml

The Climatology Page (above) also contains a wealth of information on recent weather conditions around Central Pennsylvania. In addition to summaries for the current and previous months, we have daily data in many formats (text and graphs). We have been creating maps of daily precipitation for a while, but Ron recently added bar/line graphs of daily rainfall and temperatures for our Co-operative Climate stations (stations that report daily). We also have links to the State Climatologist, Paul Knight, and the National Climatic Data Center, who keep the records for all of Pennsylvania, and United States, respectively.

The hydrologists at the Mid Atlantic and Ohio River Forecast Centers have worked very hard to put together a very comprehensive web site for all your River Information. The future of River Prediction is here, and is known as Advanced Hydrologic Prediction Services (AHPS). The information found on the new website employs a new river forecasting technique, known as probabilistic forecasting. Current observations, and the latest forecasts (in many forms) may be found on the AHPS Page at:

http://ahps.erh.noaa.gov/cgi-bin/ahps.cgi?ctp

As always, check our Front Page for the latest news and developments:

http://www.nws.noaa.gov/er/ctp/

or go to

http://weather.gov

and click on Central PA on the big map.

Spring – A Season of Change

by Greg DeVoir, Senior Forecaster

A wise man once said, "The only thing constant in life is change." Since weather patterns are always changing, this phrase universally applies to weather forecasting in any season. However, there's little doubt that spring can be the cruelest season of all when it comes to changeable weather. Quite often, Mother Nature teases us with glorious sunshine, singing birds and 70-degree days, only to dash our hopes the next day with a cold slushy dose of reality. Other warm-ups can be rudely interrupted by strong Canadian cold fronts surging southward, often preceded by severe thunderstorms.

After a long, harsh winter which gripped Central Pennsylvania from mid-October through early March, it may be hard to comprehend that real warmth and humidity may only be weeks or even just days away. However, history reminds us that anything is possible when it comes to spring weather in this part of the country. Take recent history, for example. As I first began writing this article during the second week of March 2003, my home thermometer registered a mere 6 degrees as I battled a nasty flu. Two weeks later, all was right with the world as highs soared near 70 for the first time this year. And yet, this morning's computer models are advertising potential severe weather this weekend, followed by a chance of snow over northeast Pennsylvania. One thing is for sure in spring, anything can (and usually does) happen.

Only a few years ago, the first two weeks of March 2000 featured unseasonable warmth from much of the central Plains and Upper Midwest

into the northeastern States. On March 8, 2000, Williamsport recorded a high of 81 degrees. Not to be outdone, Harrisburg International Airport soared to 84 degrees. While ninety-degree temperatures have not occurred at either location during the month of March, both Harrisburg and Williamsport share April 17 as the earliest 90-degree day on record.

While the atmosphere seems quite indifferent to such drastic swings in temperature, the human body is another story. The first warm or hot weather of the season prompts many to grab the nearest available garden trenching tool or softball bat and glove and head outdoors. It's a good idea to take it easy the first few times out, especially if you've led a sedentary lifestyle during the long winter months.

Here are some smart tips to keep in mind when the increasingly warm days of spring start to feel more like summer (Courtesy of the American Red Cross).

- ✓ **Limit your activity** – Muscles that have gone unused for months will need to be exercised and stretched before full days can be spent in the garden, on the tennis court or in the outfield. If it's extraordinarily hot or humid, schedule your outdoor activities for early in the morning or late in the evening rather than in the full heat of the day.

- ✓ **Drink plenty of fluids** – Water, juice and sports drinks are preferable, and stay away from caffeinated or alcoholic beverages which promote dehydration.

- ✓ **Block UV Radiation** – Use sunscreen! Applying a sunscreen of SPF 15 or higher when you plan to be outside during the hours of 10 am and 2 pm. Wear sunglasses that block at least 95% of UV rays.

- ✓ **Routinely receive the latest weather forecasts** – Spring weather can be extremely volatile. Regularly check the latest weather forecasts and keep an eye to the sky when outdoors. Have a pre-planned shelter in mind so that quickly forming thunderstorms will not threaten you or your family's safety.

A Note to Our COOP Observers

by Paul Head, Cooperative Program Manager

This note is to thank all the COOP observers who acted as spotters for us during this past winter. In case the reader does not know what a COOP observer does, let me describe a typical observer's morning during the winter.

The alarm goes off anytime between 0530 and 0630. It is dark so a light goes on. Joe's wife, Martha, groans and turns away from the light source. Clothes are found and put on. The dog gets excited and starts to run around, her claws skittering across the hardwood floor. This annoys Martha even further. The gloves, hat, and winter coat are located and a move is made toward the door. The observer reaches in to a pocket of the coat to find his flashlight and National Weather Service COOP observer magnifying glass. Satisfied that they will be able to see when they arrive at the National Weather Service issue Standard 8 inch rain gage and snow board, they turn the door knob and open the door. The window pane on the storm door is frozen with beautiful designs of frost. Taking in a deep breath of furnace-warmed air, and pulling the ear flaps down, he opens the storm door. A sharp eye watering, freeze-your-nose-hairs blast of wind rips the door out of his hand and slams it against the side of the house. The spouse shouts, "Can't you be more quiet?" Joe ignores the spouse because he is looking for the dog which disappeared into a snow drift and is nowhere to be seen. He grabs his rain stick and reaches for the storm door which continues to bang against the side of the house. Realizing he will need some hot water to melt down the freshly fallen snow he latches the storm door and returns to the kitchen.

"Darn weathermen," Joe grumbles. "When are they ever going to get it right? It wasn't supposed to snow last night…"

Through eyes still watering from the cold, Joe pours hot water into the inner tube of his standard 8 inch rain gage and measures it with his rain stick. He then opens the door, holding his flashlight in his mouth, and with the inner can of his National Weather Service issue standard 8 inch rain gage between his knees, and with the funnel in his left hand, he manages to prevent the storm door from slamming against the wall again. Once outside he fights to remain standing while he carries the funnel and the inner can to the outer can and skillfully pours the steaming water into the brass cylinder. He subtracts the water that he poured into the can

from the water that he now measures and he has his melted precipitation for the previous 24 hours.

Joe's next task is to find the snow board also sent to him by his National Weather Service representative. He manages to locate it by the flag he posted near it after the first time he lost it back in November. The snow board is white and difficult to find in the snow but he dutifully measures the previous 24 hours snowfall and starts poking the snow stick into the snow to try and get an average of the glaciated snow in his back yard for his snow on the ground measurement. He hears a yelp and realizes he has found his dog. With the measurements in his mind and with the inner can, funnel, snow stick, rain stick, and flashlight in his hands, the observer and his new found dog battle their way back to the warmth of the house.

Once inside, Joe's glasses fog up and his nose lets down. His cheeks and finger tips become itchy as they begin to thaw. At least Joe no longer has to read mercurial thermometers in his outside shelter and prolong the arctic blast buffeting his body. Thanks to technology, he sits down in front of his digital thermometer and waits for the blurry green light to focus into readable numbers. He notes the current temperature and pushes buttons for the max and min, writing them down as he does. He then resets the unit and moves to his next task.

ROSA stands for Remote Observation System Automation. Joe's National Weather Service representative told him that when he demonstrated how to use it 10 years ago. Joe has long since forgotten what the acronym stands for, but punching the series of numbers and pound signs into this programmable phone has become automatic. These numbers and pound signs turn his observed data into something the forecasters at the National Weather Service and River Forecast Centers can use in their computer models. The forecasters then predict how much flooding will occur downstream from Joe and Martha.

"Thank you. Your message is accepted." The computer generated voice tells him.

The above scenario is repeated in thousands of homes across the United States every morning. During the summer, the typical observation takes less than 5 minutes. In the winter that time can be tripled during cold snowy mornings. Additionally, forecasters at the National Weather Service need up to the minute snowfall information during snowstorms. Many COOP observers in Central Pennsylvania were available this winter for those extra reports.

We here at the National Weather Service in State College, as well as the rest of the public you serve, want to thank you for your service during this past winter. Preliminary statistics compiled from **your** data indicate this winter will probably be one of the top 10 snowiest winters since records have been kept in this region.

I would like to recognize Henry Lush in Galeton, Tony Pierotti in Coudersport, Frank Gough in Benton, Ron Yurchak in Tamaqua, Spencer Duffee in Spring Creek, Jamie Stone in Renovo, William Rense at Shippensburg University, Joe Kaminski in Wolfsburg, and Kevin Guerrier on Laurel Summit for their service as impromptu spotters during the past few months.

Jamie Stone, William Rense, Ron Yurchak, and Joe Kaminski did not make one error recording snowfall and snow on the ground during the entire winter. Thank you. I look forward to visiting with all our COOP observers during the upcoming months.

Doppler Radar Severe Weather Signatures

by Barry Lambert, Senior Forecaster

Forecasters at the NWS in State College pay close attention to a wide range of forecast information which prepares them for a particular type of severe convective weather event that may develop across Central Pennsylvania (hail, widespread damaging straight-line winds, microbursts, tornadoes, and flash flooding). This "situational awareness" becomes very valuable to the forecaster (and general public) as specific radar patterns of a thunderstorm can quickly be related to a certain classification of severe weather which can be promptly warned for.

Before any severe weather erupts across the region, early in the day (or even the previous day) forecasters are trying to anticipate the primary storm type by analyzing parameters such as: Convective temperature (i.e., what time thunderstorms will develop), moisture, Instability (how strong will the storm's updraft be, and how tall will it grow – will there be hail), vertical wind shear (will the storm produce

strong damaging straight-line wind gusts, or is there a threat for tornadoes).

Below are examples of various storm types here in Central Pennsylvania during the past several years, why we issued a certain type of warning, and what damage (if any) was reported.

Storm Type Signatures

In Figure 8, note the anticyclonic velocity couplet (red = outbound; green = inbound) shown on the Sterling, Virginia WSR-88D (the storms are northwest of the radar). Severe Thunderstorm Warnings were issued for this storm because of its organized storm structure and rotation, including an elevated strong reflectivity core. This storm moved in an unusual direction (to the south southwest) along Interstate 81 in Franklin County. Hail the diameter of quarters occurred, along with straight-line wind damage. Storm structure is often easily discernable in the field. *Note that if it were not for the storm relative velocity (upper images), forecasters may be forced into issuing incorrect Tornado warnings based only on the storm's reflectivity configuration with an apparent hook echo on its southern extent.

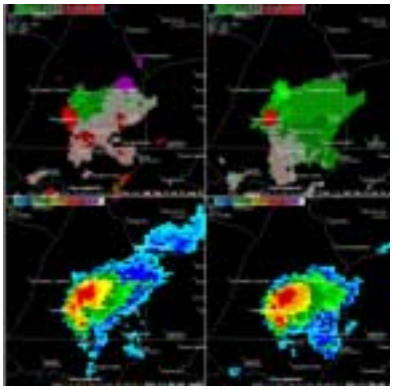

Figure 8. Strong anticyclonically rotating Pulse Thunderstorm (Franklin County Aug 1, 2002)

The next rather innocuous looking storm (figure 9) contained a damaging downburst that was accentuated as it descended and moved south through a gap in an east/west ridge line.
No warning was issued for this storm, which was at the weaker end of numerous other storms that evening.

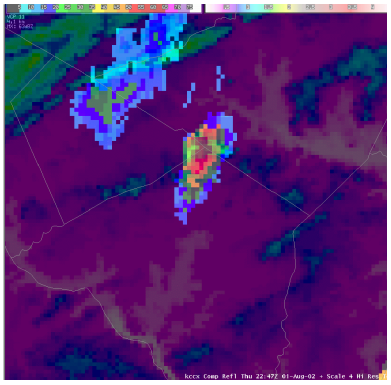

Figure 9. Weak Pulse Thunderstorm (Microburst) – Lancaster County, August 1, 2002.

Figure 10 is the 5:36 pm EDT radar "reflectivity" image from Pittsburgh showing a classic hook echo associated with a super cell over western Somerset County. The storm contained a long-lived tornado that originated near Pittsburgh, and eventually moved southeast to Frostburg Maryland where it became the strongest on record in Maryland history. The classic configuration of the echo and doppler radar storm velocity helped forecasters issue Tornado warnings with excellent lead time for communities in the path of this devastating storm.

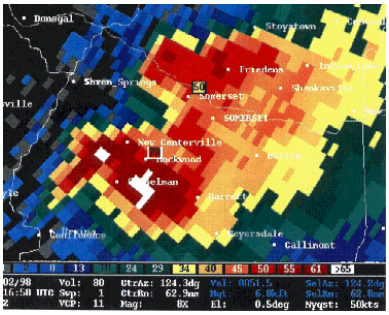

Figure 10. Strong Cyclonically Rotating Thunderstorm (Mesocyclone/Tornado) – Somerset County, June 2, 1998.

Figure 11 shows a sequence of reflectivity images (in sequence from upper left to lower right) that were taken about 30 minutes apart. Shown is a series of storms that "trained" from west to east over the city of Gettysburg causing nearly 11 inches of rain in 3 hours. State College forecasters recognized the evolving dangerous

situation and utilized Doppler radar derived rainfall rates (not shown here) to issue highly accurate Flash Flood warnings for Adams County.

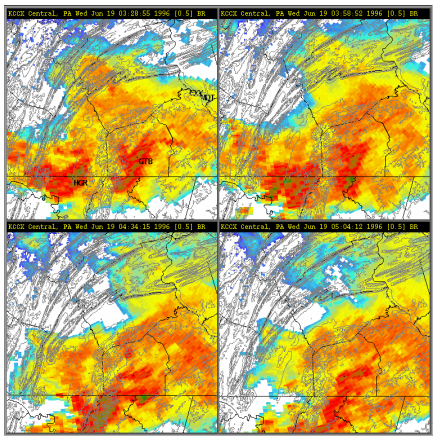

Figure 11. Multicell Training Thunderstorms (Flash Floods) – Adams County, June 18-19, 1996

Figure 12 shows a "Bow Echo". Numerous Severe Thunderstorm warnings were issued for this, and other similar storms in an extensive north-south line, because of the classic high wind signature of the bow, and "eroding" reflectivity to the west by the descending mid level jet and dry air. Straight-line wind damage by gusts around 70 mph was concentrated at the apex of the bow. Storm structure is usually very difficult to discern in the field.

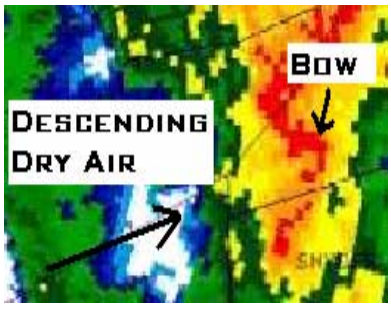

Figure 12. North-South Line of Thunderstorms (Bow Echoes/Serial Derecho)

What's new with NOAA Weather Radio?

by Dave Ondrejik, Warning Coordination Meteorologist

As some of you know, a new NOAA Weather Radio (NWR) transmitter has been installed in Blair County. The transmitter is located near Altoona on Brush Mountain (Frankstown, PA). This station (WGN-589) operates at 300 Watts on a frequency of 162.425 Megahertz and now provides NWR coverage for all of Blair County as well as parts of surrounding counties. Radio coverage maps can be found on line at: http://www.nws.noaa.gov/nwr

The installation of this transmitter marks the 17th transmitter to be installed in Pennsylvania. Additionally, there are many other transmitters that cover parts of Pennsylvania, but are outside the Commonwealth's boarders.

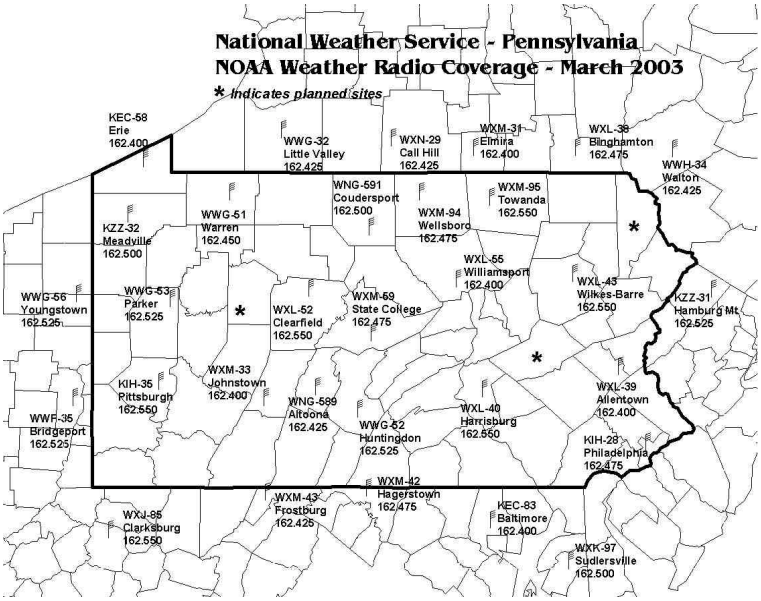

Figure 13. Map of NOAA Weather Radio transmitter location with frequency.

This NWR transmitter was made possible by a grant from the Pennsylvania Emergency Management Agency (PEMA) to Blair County Emergency Management Agency in coordination with the National Weather Service. This transmitter will broadcast daily weather forecasts, warnings for tornadoes, damaging thunderstorms, floods, high winds and heavy snow. Additionally, current weather conditions, short term forecasts and weather summaries will also be aired.

NOAA Weather Radios are frequently described as "All Hazard Radios". They are named this way as they can be used to alert the public for many different hazards. These radios can be used to alert the public for a multitude of Civil Emergencies such as chemical releases, oil spills, 911 outages Homeland Defense information and soon will be used for AMBER Alerts (Child Abductions).

You can purchase these NWRs at your local electronics store or a department store with an embedded electronics department. Additionally, they can be ordered through mail order catalogues and on the Internet.

Here are some helpful hints if you decide to purchase a NWR:

* Get one with a battery backup. Most radios come with power supplies that plug into your electrical system. However, during bad weather and other emergency conditions, the power may go out, thus the battery is needed. Remember to change your battery when you change your smoke detector battery.

* Make sure your radio has an alert feature. This feature will set off a siren anytime the National Weather Service issues a warning.

* Purchase a NWR with SAME technology. SAME stands for "Specific Area Message Encoding". This feature allows you to program your radio so it only alerts you when a warning is issued for your county. Most SAME radios allow you to program several counties into the radio, thus you can track weather heading your way.

* Depending on the location of your house/business in relation to the nearest NWR transmitter, and the location of the radio inside your home/business, you may need an external antenna to receive the broadcast. If you think you may have trouble getting reception, look for a model with an external antenna jack.

These radios range in price from $20 to over $100 depending on the features of the radio. Some are even have AM/FM radios with alarms so you can keep them by your bedside. There are also features for the deaf and hearing impaired.

If you have a NWR, you know that the voice on air is computer driven. This current voice, named "Craig", was upgraded about a year ago. We are expecting to upgrade the voice again during the summer. "Tom" will be introduced (scheduled for June/July) and "Craig" will get some much needed rest.

If you would like more information about NOAA Weather Radio, please point your Internet browser to our homepage:

http://www.nws.noaa.gov/er/ctp

SKYWARNEWS

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